WHAT IS CLAIMED IS:

1. A method of removing one or more particle(s) adhered to a surface of a substrate, comprising:

selecting laser energy transfer parameters and a composition of an energy transfer medium based on a composition of the one or more particle(s) to be removed and a composition of the substrate;

arranging an energy transfer medium having said composition under and around the one or more particle(s) to be removed; and

irradiating at least said energy transfer medium with laser energy having said selected laser energy transfer parameters, wherein said laser energy transfer parameters and said composition of said energy transfer medium were selected to effect removal of the one or more particle(s) from the surface.

2. The method according to claim 1, wherein the step of arranging an energy transfer medium under and around the one or more particle(s) to be removed and the surface comprises adsorbing an energy transfer medium under and around the one or more particle(s) to be removed.

3. The method according to claim 1, wherein the laser energy transfer parameters comprise the wavelength of the laser energy, the density of the laser energy, the pulse length and shape of the laser energy, the pulse repetition rate of the laser energy, and the laser beam size and/or shape, and the irradiation geometry of the particle(s)/substrate/energy transfer medium.

4. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters comprises selecting the wavelength of the laser energy.

5. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters comprises selecting the density of the laser energy.

6. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters comprises selecting the pulse length and shape of the laser energy.

7. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters comprises selecting the pulse repetition rate of the laser energy.

8. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters comprises selecting the laser beam size and/or shape.

9. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters comprises selecting the irradiation geometry of the particle(s)/substrate/energy transfer medium.

10. The method according to claim 1, wherein the step of irradiating at least the energy transfer medium comprises irradiating the particle(s)/substrate/energy transfer medium combination.

11. The method according to claim 1, further comprising selecting ambient conditions based on a composition of the one or more particle(s) to be removed and a composition of the substrate.

12. The method according to claim 4, wherein the wavelength of the laser is selected such that the laser energy diffracts around at least some of the one or more particle(s) to be removed.

13. The method according to claim 4, wherein the wavelength of the laser is selected such that it is substantially the same size as the one or more particle(s) to be removed.

14. The method according to claim 1, wherein the composition of the energy transfer medium is selected such that it will couple efficiently with the laser energy of the laser.

15. The method according to claim 1, wherein the step of selecting the laser energy transfer parameters and the composition of the energy transfer medium comprises selecting at least one of the wavelength of the laser energy, the density of the laser energy, the pulse length and shape of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, and/or the ambient conditions.

16. The method according to claim 15, wherein the step of selecting the laser energy transfer parameters and the composition of the energy transfer medium further comprises selecting the amount and disposition, and the composition of the energy transfer medium.

17. The method according to claim 16, wherein the laser wavelength of the laser energy, the density of the laser energy, the pulse length and shape of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, the ambient conditions, the amount and disposition of the energy transfer medium, and/or the composition of the energy transfer medium are selected based on application and environment.

18. The method according to claim 1, wherein the laser energy is sufficient to be absorbed by the energy transfer medium, either directly or by conduction from the substrate.

19. The method according to claim 4, wherein the wavelength of the laser energy is targeted to the one or more particle(s), the substrate and/or the energy transfer medium.

20. The method according to claim 6, wherein the pulse length of the laser energy is sufficiently short in order to achieve a desired temperature distribution of the energy transfer medium.

21. The method according to claim 5, wherein the laser energy density is sufficient to be absorbed by the one or more particle(s), the substrate, or the energy transfer medium.

22. The method according to claim 8, wherein the laser beam size and/or shape is selected to clean as large a surface area as possible.

23. The method according to claim 1, wherein the energy transfer medium is a uniform layer of thickness, adsorbed under and around the one or more particle(s) to be removed, or a combination thereof.

24. The method according to claim 23, wherein the energy transfer medium is a uniform layer of thickness.

25. The method according to claim 23, wherein the energy transfer medium is adsorbed under and around the one or more particle(s) to be removed.

26. The method according to claim 1, wherein the energy transfer medium comprises a condensable material that is strongly absorbing at the selected wavelength.

27. The method according to claim 1, wherein the energy transfer material comprises an azeotrope.

28. The method according to claim 1, wherein the energy transfer material comprises separately controlled multiple dosers.

29. The method according to claim 1, wherein the energy transfer material comprises a constant composition non-azeotropic single doser.

30. The method according to claim 1, wherein the step of irradiating at least the energy transfer medium with laser energy comprises irradiating a surface of the substrate opposite to the surface containing the energy transfer medium.

31. The method according to claim 1, wherein the substrate comprises a non-absorbing material, and the energy transfer medium comprises an absorbing mixture.

32. The method according to claim 31, wherein the substrate comprises at least one of SiO_2 and a CaF_2 substrate, and the energy transfer medium comprises an azeotrope of benzyl alcohol and water.

33. A method of removing one or more particle(s) adhered to a surface of a substrate, comprising:

adsorbing an energy transfer medium under and around the one or more particle(s) to be removed;

irradiating the one or more particle(s), the substrate, the energy transfer medium, or a combination thereof with laser energy; and

selecting two or more of the laser wavelength of the laser energy, the pulse length and shape of the laser energy, the density of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, the ambient conditions, an amount and disposition of the energy transfer medium, and a composition of the energy transfer medium to precisely control an energy deposition into the one or more particle(s), the substrate, the energy transfer medium or a combination thereof; and

absorbing sufficient energy in the particle(s), the substrate, the energy transfer medium, or a combination thereof to dislodge the one or more particle(s) from the surface.

34. The method according to claim 33, wherein two or more of the laser wavelength of the laser energy, the pulse length and shape of the laser energy, the density of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or

shape, the irradiation geometry, the ambient conditions, the amount and disposition of the energy transfer medium, and the composition of the energy transfer medium are selected based on application and environment to precisely control an energy deposition into the one or more particle(s), the substrate, the energy transfer medium, or a combination thereof.

35. A method of removing one or more particle(s) from a surface of a sample, comprising:

selecting an optical radiation source having an optical energy distribution;

determining a tailored composition to serve as an energy transfer medium for said optical radiation source having said optical energy distribution; and

determining a tailored optical pulse of said optical radiation source in view of said composition, a surface of a sample, a sample and/or one or more particle(s) to be removed from a sample, such that when said energy transfer medium is arranged on the surface of the sample having the one or more particle(s) and is subsequently irradiated by said optical radiation source, sufficient energy is transferred from the tailored optical pulse to said one or more particle(s) via the energy transfer medium to dislodge said one or more particle(s) from the surface.

36. A method of removing one or more particle(s) from a surface of a sample, comprising:

determining an optical energy distribution of an optical radiation source based on the optical characteristics of a surface of a sample, a sample and/or one or more particle(s) to be removed from the sample;

tailoring a composition of an energy transfer medium in view of optical properties of said sample and said optical energy distribution;

determining a tailored pulse in view of said composition, said optical energy distribution, the surface, the sample and/or the one or more particle(s) to be removed from the sample;

applying said energy transfer medium to the surface of the sample; and

irradiating at least the energy transfer medium with the tailored pulse thereby dislodging the one or more particle(s) from the surface.

37. A method of removing one or more particle(s) from a surface of a sample, comprising:

arranging an energy transfer medium on a surface of a sample;

irradiating said energy transfer medium with a tailored optical radiation pulse, whereby energy from said tailored optical radiation pulse is absorbed largely by said

energy transfer medium but not significantly by the sample causing the one or more particle(s) to be removed from the surface.

38. A system for removing one or more particle(s) from a surface of a sample, comprising:

a unit that applies an energy transfer medium on the surface of the sample; and

a tailored irradiation source that irradiates the energy transfer medium, the sample and/or the one or more particle(s) with a tailored optical radiation pulse, whereby energy from said tailored optical radiation pulse is absorbed by said energy transfer medium causing the one or more particle(s) to be removed from the surface.

39. An optical radiation source for removing one or more particle(s) from the surface of a sample having an energy transfer medium with known optical properties, comprising:

a laser source that outputs radiation having an energy distribution;

a pulse tailoring unit coupled to said laser source for forming tailored output pulses of said laser source such that, when said tailored output pulses are directed to said energy transfer medium, energy from said tailored output pulses is absorbed by the energy transfer medium causing one or more particle(s) to be removed from a surface of a sample.

40. A system for removing one or more particle(s) from a surface of a sample, comprising:

a unit that applies an energy transfer medium on the surface of the sample; and

a tailored irradiation source that irradiates the energy transfer medium, the sample, and/or the one or more particle(s), with a tailored optical radiation pulse, whereby energy from said tailored optical radiation pulse is absorbed by said energy transfer medium causing the one or more particle(s) to be removed from the surface.

41. An apparatus configured to accelerate particles, comprising:

a source of laser energy;

a substrate having a surface and a predetermined shape and configured to receive at least a portion of said laser energy from said source;

a plurality of particles arranged on said surface; and

an energy transfer medium disposed upon said surface and configured to receive at least a portion of said laser energy, whereby said plurality of particles are accelerated from said surface either by direct absorption or conduction.

42. The apparatus of claim 41, further comprising a laser energy focusing device configured to focus at least a portion of the laser energy from said source.

43. The apparatus of claim 41, further comprising a shaped aperture configured to block at least a portion of said laser energy from said source in order to create a pattern.

44. The apparatus of claim 41, further comprising means to vary an angle of incidence of the laser energy from said source upon said energy transfer medium.

45. The apparatus of claim 41, wherein said particles are distributed in a substantially uniform pattern within said energy transfer medium.

46. The apparatus of claim 41, wherein said particles are distributed in a substantially non-uniform pattern within said energy transfer medium.

47. The apparatus of claim 41, wherein said particles are substantially spherical.

48. The apparatus of claim 41, wherein said particles are randomly shaped.

49. The apparatus of claim 41, wherein said particles are hollow.

50. The apparatus of claim 41, wherein said particles comprise a metallic material.

51. The apparatus of claim 41, wherein said particles comprise a ceramic.

52. The apparatus of claim 41, wherein said particles comprise a glassy material.

53. The apparatus of claim 41, wherein said particles comprise a resinous material.

54. The apparatus of claim 41, wherein said particles comprise an electrostatic charge.

55. The apparatus of claim 41, wherein said substrate is substantially transparent.

56. The apparatus of claim 41, wherein said substrate is substantially opaque.

57. The apparatus of claim 41, wherein said substrate is substantially translucent.

58. The apparatus of claim 41, wherein said substrate comprises a metallic material.

59. The apparatus of claim 41, wherein said substrate comprises a ceramic.

60. The apparatus of claim 41, wherein said substrate comprises a glassy material.

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61 ~~62~~. The apparatus of claim 41, wherein said substrate comprises a resinous material.

62 ~~63~~. The apparatus of claim 41, wherein said surface is planar.

63 ~~64~~. The apparatus of claim 41, wherein said surface is curved.

64 ~~65~~. A method of removing one or more particle(s) adhered to a surface of a substrate, comprising:

irradiating the one or more particle(s), the substrate, or a combination thereof with laser energy; and

selecting two or more of the laser wavelength of the laser energy, the pulse length and shape of the laser energy, the density of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, and/or

the ambient conditions to precisely control an energy deposition into the one or more particle(s), the substrate, or a combination thereof; and

absorbing sufficient energy in the particle(s), the substrate, or a combination thereof to dislodge the one or more particle(s) from the surface.

~~66~~ 65. The method according to claim ~~65~~ 64, wherein two or more of the laser wavelength of the laser energy, the pulse length and shape of the laser energy, the density of the laser energy, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, and/or the ambient conditions are selected based on application and environment to precisely control an energy deposition into the one or more particle(s), the substrate, or a combination thereof.